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PATENT ABSTRACTS OF JAPAN

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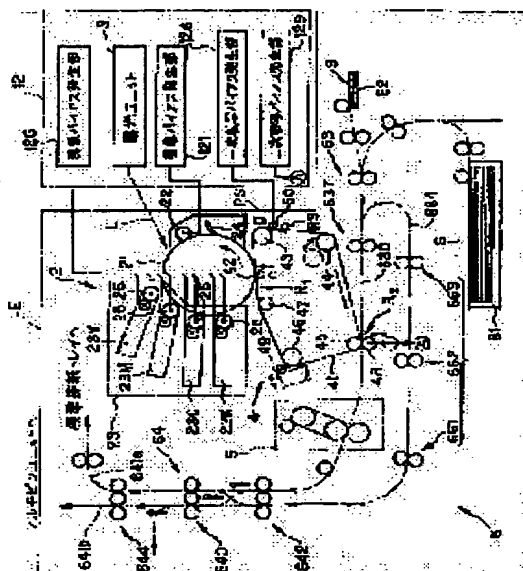
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(54) COLOR FORMING SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image forming system for stabilizing the transfer efficiency of all the color toner images in an image forming device equipped with plural color developing devices and transferring the toner image to an intermediate transfer medium.

SOLUTION: The image forming device is provided with a latent image carrier 21, plural developing devices 23Y, 23M, 23C and 23K, a primary transfer part R1 transferring the toner image successively developed with different color toner to the intermediate transfer medium 41, a primary transfer bias applying power source 126 for applying bias at the primary transfer part, and a secondary transfer part R2 transferring all the color toner images superposed and transferred on the intermediate transfer medium to recording paper, and uses a constant-voltage power source as the primary transfer bias applying power source. In the device, the developing device is selected in order that primary transfer efficiency is not good from the plural developing devices 23Y, 23M, 23C and 23K, and the corresponding color toner image is developed on the surface of the latent image carrier 21.



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CLAIMS

[Claim(s)]

[Claim 1] An image formation method which is equipped with the following and characterized by developing a toner image of a color with which primary imprint effectiveness chooses a development counter as bad order, and corresponds to it from said two or more development counters in image formation equipment with which a constant voltage power supply is used as said primary imprint bias impression power supply on a front face of said latent-image support. Latent-image support in which it is uniformly charged on a front face with an electrification means, rotating, it discharges selectively with an exposure means, and an electrostatic latent image is formed Two or more development counters which give a color toner of a selectively different color to a front face of this latent-image support, and use said latent image as a visible image The primary imprint section which imprints a toner image developed with a color toner of a different color one by one to a medium transfer medium The secondary imprint section which imprints a primary imprint bias impression power supply for impressing bias in the primary imprint section, and all color color toner images piled up and imprinted on a medium transfer medium on the recording paper

[Claim 2] An image formation method according to claim 1 characterized by using a constant current power supply as a secondary imprint bias impression power supply for impressing bias in the secondary imprint section.

[Claim 3] An image formation method according to claim 1 or 2 which is equipped with a processing laboratory where specification-part material to which said two or more development counters of each regulate at least thickness of a toner layer with which it is supported by a developing roller and its front face has been arranged, and is characterized by level of a toner in said processing laboratory differing for every development counter by making a contact location to said developing roller of said specification-part material into a criteria location.

[Claim 4] An image formation method according to claim 1 or 2 characterized by the amounts of electrifications of a toner by said two or more development counters differing for every development counter.

[Claim 5] An image formation method according to claim 1 or 2 characterized by the fluidities of a toner of two or more of said development counters differing for every development counter.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the image formation method of image formation equipment equipped with the medium transfer medium which the toner image especially formed on latent-image support, such as a photo conductor, is imprinted primarily, and imprints this toner image secondarily to a record medium further about the image formation method of image formation equipments, such as a printer which used the xerography, facsimile, and a copying machine.

[0002]

[Description of the Prior Art] Generally the image formation equipment using electrophotographic technology The photo conductor which has a sensitization layer in the peripheral face as latent-image support, and an electrification means to electrify the peripheral face of this photo conductor uniformly, An exposure means to expose selectively the peripheral face uniformly electrified by this electrification means, and to form an electrostatic latent image, It has the development means which the toner as a developer is electrified in the electrostatic latent image formed by this exposure means, gives to it, and is used as a visible image (toner image), and imprint equipment which makes record media, such as a form, imprint the toner image developed by this development means.

[0003] And as imprint equipment which makes record media, such as a form, imprint the toner image developed on the photo conductor, the thing equipped with the medium transfer medium which the toner image formed on the photo conductor is imprinted (primary imprint), and imprints this toner image to a record medium further (secondary imprint) is known conventionally.

[0004] Drawing 10 is drawing showing one example of image formation equipment equipped with such a medium transfer medium, and is a b-b fragmentary sectional view [in / (a) and / in (b) / drawing (a)]. [an outline perspective diagram]

[0005] In drawing 10, 201 is a photo conductor and has conductive layer 201a and sensitization layer 201b formed on this conductive layer 201a. Conductive layer 201a is grounded.

[0006] 202 is a medium transfer medium, for example, the volume-resistivity value consists of 10⁷-10¹⁴ohm dielectrics it is [dielectrics] of abbreviation cm (inside resistive layer). Such a medium transfer medium 202 can be created by kneading conductive carbon to synthetic resin etc.

[0007] The medium transfer medium 202 contacts a photo conductor 201 at the time of image formation at least, and this contact section R1 forms the primary imprint section. In the primary imprint section R1, the primary imprint roller 203 is arranged among the medium transfer media 202 at the way, and primary imprint voltage is impressed to the medium transfer medium 202 by the pressure welding of this primary imprint roller 203.

[0008] Moreover, the pressure welding of the secondary imprint roller 204 which impresses secondary imprint voltage is carried out to the medium transfer medium 202, and this pressure-welding section forms the secondary imprint section R2. The backup roller 205 is arranged from the way among the medium transfer media 202 at the secondary imprint section R2.

[0009] At the time of image formation, after revolution actuation of a photo conductor 201 and the medium transfer medium 202 is carried out and sensitization layer 201b of a photo conductor 201 is first electrified uniformly with an electrification means (not shown), it is selectively exposed with an exposure means (not shown), and an electrostatic latent image is formed. Subsequently, the toner which is a developer is given to an electrostatic latent image by the development means (not shown), and it becomes a visible image (toner image), and this toner image is imprinted on the medium transfer medium 202 in the primary imprint section R1, and is imprinted by record media, such as a form supplied to this secondary imprint section R2, in the secondary imprint section R2 after that.

[0010] When the record medium with which the toner image was imprinted passes the fixing assembly which is not illustrated, it is fixed to a toner image.

[0011] In the image formation equipment which has the medium transfer medium 202 formed by the above uniform resistors, generally, although imprint electric field are given by the primary imprint roller 203 which contacts an imprint section rear face, when distortion etc. occurs in the medium transfer medium 202 or a contaminant adheres to the primary imprint roller 203, it becomes impossible to give electric field selectively, and unevenness occurs in the image which the electric field of the imprint section became uneven and was imprinted.

[0012] Then, conductive layer 202a formed in one as a medium transfer medium 202 on insulating base 202c which consists of synthetic resin as shown in drawing 11, The thing using what consisted of resistive layer 202b by which is formed in one on it and a pressure welding is carried out to a photo conductor 201 is also known. In that case In

the side edge section of that medium transfer medium 202, resistive layer 202b is removed to band-like, and conductive layer 202a is exposed to band-like, and an electrode roller contacts this outcrop and he is trying to impress primary *****. Thus, in the image formation equipment using the medium transfer medium 202 which has conductive layer 202a, since the electric field of a uniform imprint can be given throughout the imprint section also when distortion occurs in the medium transfer medium 202 or a contaminant adheres to the roller of the imprint section, it has the advantage in which the image unevenness resulting from an imprint is lost.

[0013] In the image formation equipment using the medium transfer medium 202 which has conductive layer 202a to which such primary ***** is impressed, in order to have to make the timing of a primary imprint and a secondary imprint have to lap for improvement in the speed, a constant voltage power supply is used as a primary imprint voltage power supply, and the constant current power supply is used as a secondary imprint voltage power supply (JP,9-160395,A).

[0014] In addition, in U.S. Pat. No. 5,243,392, a volume-resistivity value is 1012ohms more than of abbreviation cm, and the thing to which the relaxation time makes a secondary imprint perform efficiently using medium imprint object data medium of the high resistance belt of 0.3 - 200ms is proposed.

[0015]

[Problem(s) to be Solved by the Invention] In a configuration like drawing 10 and drawing 11, although the phenomenon from which a toner scatters between lines or it escapes makes it generating notably, and deterioration of a line image will be remarkable or will be easy to generate photo conductor memory if the low medium transfer medium 202 of a volume resistivity is used, these problems are solvable by making the volume resistivity of the medium transfer medium 202 to some extent high.

[0016] However, if resistivity becomes high, the charge from a photo conductor will be charged in a medium transfer medium, it will be hard coming to escape a charge, and a problem will arise. If it specifically becomes beyond the fixed potential difference with photo conductor surface potential and the belt surface potential of a medium transfer medium, discharge will arise, and it happens that a medium transfer medium is charged by the medium transfer medium in response to the minus charge of a photo conductor (when carrying out minus electrification of the photo conductor). Photo conductor surface potential V0 It is usually the photo conductor surface potential V0 by property change change with development properties of a development counter and according to the color of a development counter, or the elapsed time from the early stages of an activity etc. The set points differ greatly. Therefore, the amount of negative charges which a medium transfer medium receives from a photo conductor will also be various, and medium transfer-medium surface potential will be stabilized.

[0017] Since fixed work is done to the photo conductor image section by carrying out constant current control of the primary imprint, the problem by medium transfer-medium surface potential not being stabilized is not produced at the flash imprinted primarily at least.

[0018] However, as described above, when a constant voltage power supply was used as a primary imprint voltage power supply, medium transfer-medium surface potential fell greatly, and since the condition that the potential difference with the photo conductor image section ran short was not canceled, it turned out that the problem that imprint effectiveness falls arises. When developing the toner image of a color which the perimeter of a photo conductor arranges the development counter of two or more colors, chooses in order, and is different especially and imprint effectiveness chooses the thing of the worst color as the development counter or toner of the last color with which medium transfer-medium surface potential falls most, imprint effectiveness may get still worse and may invite a defect for a primary imprint.

[0019] Although it might say that the medium imprint belt which constitutes a medium transfer medium was discharged as this cure, since the cost rise and the rise of power consumption were caused by the electric discharge machine and the power supply required for it, it was not desirable.

[0020] This invention is made in view of such a trouble of the conventional technology, and the object is set with the image formation equipment which is equipped with the development counter of two or more colors, and imprints a toner image to a medium transfer medium, and is to offer the image formation method which stabilizes the imprint effectiveness of the toner image of all colors.

[0021]

[Means for Solving the Problem] An image formation method of this invention which attains the above-mentioned object Latent-image support in which it is uniformly charged on a front face with an electrification means, rotating, it discharges selectively with an exposure means, and an electrostatic latent image is formed, Two or more development counters which give a color toner of a selectively different color to a front face of this latent-image support, and use said latent image as a visible image, The primary imprint section which imprints a toner image developed with a color toner of a different color one by one to a medium transfer medium, A primary imprint bias impression power supply for impressing bias in the primary imprint section, In image formation equipment with which it has the secondary imprint section which imprints all color color toner images piled up and imprinted on a medium transfer medium on the recording paper, and a constant voltage power supply is used as said primary imprint bias impression power supply It is characterized by developing a toner image of a color with which primary imprint effectiveness chooses a development counter as bad order, and corresponds to it from said two or more development counters on a front face of said latent-image support.

[0022] In this case, it is desirable to use a constant current power supply as a secondary imprint bias impression power supply for impressing bias in the secondary imprint section.

[0023] This invention can be applied, when it has a processing laboratory where specification-part material to which

two or more development counters of each regulate at least thickness of a toner layer with which it is supported by a developing roller and its front face has been arranged and level of a toner in a processing laboratory differs for every development counter by making a contact location to a developing roller of specification-part material into a criteria location.

[0024] Moreover, when the amounts of electrifications of a toner by two or more development counters differ for every development counter, it can apply.

[0025] Moreover, it is also applicable to a ** case from which the fluidity of a toner of two or more development counters differs for every development counter.

[0026] Since a toner image of a color with which primary imprint effectiveness chooses a development counter as bad order, and corresponds to it from two or more development counters in this invention was developed on a front face of latent-image support That fall whenever surface potential of a medium transfer medium repeats an imprint, and carry out, the potential difference between a toner image on latent-image support and a medium transfer medium falls, and primary imprint effectiveness gets worse It will be compensated when primary imprint effectiveness of a toner image by development counter chosen behind becomes higher. Imprint effectiveness to a medium transfer medium of a toner image being stable, and causing a poor imprint is lost, and image formation equipment which is reliable, without also producing a cost rise of equipment can be realized.

[0027]

[Embodiment of the Invention] Hereafter, the configuration of the whole of one example of the printer of the image formation equipment using the xerography which applies the image formation method of this invention is explained.

[0028] Drawing 1 is drawing showing one operation gestalt of the image formation equipment which applies the image formation method of this invention. Moreover, drawing 2 is the block diagram showing the electric configuration of the image formation equipment of drawing 1. This image formation equipment is yellow (Y), a Magenta (M), cyanogen (C), and equipment that piles up the toner of four colors of black (K) and forms a monochrome image, using only the toner of black (K) in forming a full color image ****. if a picture signal is given to the Maine controller 11 of a control unit 1 from external devices, such as a host computer, with this image formation equipment — the command from this Maine controller 11 — responding — en zincon — each part of the engine section E on which truck 12 fatty tuna functions as an image formation means is controlled, and the image corresponding to a picture signal is formed in Sheet S.

[0029] A toner image can be formed in the photo conductor 21 of the image support unit 2 in this engine section E. That is, the ***** unit 2 is equipped with the pivotable photo conductor 21 in the direction of an arrow head of drawing 1, and the electrification roller 22 as an electrification means, the development counters 23Y, 23M, 23C, and 23K as a development means, and the cleaning section 24 are further arranged along the hand of cut, respectively around the photo conductor 21. High tension is impressed from the electrification bias generating section 121, and the electrification roller 22 electrifies a peripheral face in homogeneity in contact with the peripheral face of a photo conductor 21. The photo conductor 21 has conductive layer 21a and sensitization layer 21b formed on this conductive layer 21a, as shown in drawing 3.

[0030] And laser beam L is irradiated from the exposure unit 3 towards the peripheral face of the photo conductor 21 charged with this electrification roller 22. As shown in drawing 2, it connects with the picture signal change over section 122 electrically, and this exposure unit 3 carries out scan exposure of the laser beam L on a photo conductor 21 according to the picture signal given through this picture signal change over section 122, and forms the electrostatic latent image corresponding to a picture signal on a photo conductor 21. For example, when the picture signal change over section 122 has flowed with the patch creation module 124 based on the command from CPU123 of the engine controller 12, the patch picture signal outputted from the patch creation module 124 is given to the exposure unit 3, and a patch latent image is formed. On the other hand, when the picture signal change over section 122 has flowed with CPU111 of the Maine controller 11, according to the picture signal given through the interface 112 from external devices, such as a host computer, scan exposure of the laser beam L is carried out on a photo conductor 21, and the electrostatic latent image corresponding to a picture signal is formed on a photo conductor 21.

[0031] In this way, toner development of the formed electrostatic latent image is carried out by the development section 23. That is, in this operation gestalt, development counter 23Y for yellow, development counter 23M for Magentas, development counter 23C for cyanogen, and development counter 23K for blacks are arranged along with the photo conductor 21 as the development section 23 in this sequence. These development counters 23Y, 23M, 23C, and 23K While it is constituted free [attachment and detachment] to the photo conductor 21, respectively and one development counter in the four above-mentioned development counters 23Y, 23M, 23C, and 23K contacts a photo conductor 21 selectively according to the command from the engine controller 12 By the development bias generating section 125, high tension gives the toner of the color impressed and chosen as the developing roller 25 of a development counter to the front face of a photo conductor 21, and actualizes the electrostatic latent image on a photo conductor 21.

[0032] the toner image developed in the development section 23 — the object for blacks — it imprints primarily on the medium imprint belt 41 of the imprint unit 4 in the primary imprint field R1 located between development counter 23K and the cleaning section 24. In addition, the structure of this imprint unit 4 is explained in full detail later.

[0033] Moreover, it is failed after a primary imprint for the cleaning section 24 to be arranged from the primary imprint field R1 in the location which went to the hoop direction (the direction of an arrow head of drawing 1), and to scratch the toner which is carrying out residual adhesion to the peripheral face of a photo conductor 21.

[0034] Next, the configuration of the imprint unit 4 is explained. The imprint unit 4 is equipped with rollers 42-47, the medium imprint belt 41 over which each [these] rollers 42-47 were built, and the secondary imprint roller 48 which imprints secondarily the medium toner image imprinted by this medium imprint belt 41 on Sheet S with this operation gestalt.

[0035] Like the conventional example explained by drawing 11, as a cross section is shown in drawing 3, this medium imprint belt 41 Conductive layer 41a formed in one on insulating base 41c which consists of synthetic resin, What consisted of resistive layer 41b by which is formed in one on it and a pressure welding is carried out to a photo conductor 21 is used. In the side edge section of that medium imprint belt 41, resistive layer 41b is removed to band-like, conductive layer 41a is exposed to band-like, and when the electrode roller 50 contacts this outcrop, primary imprint voltage is impressed from the primary imprint bias generating section 126, and in imprinting a color picture on Sheet S Make the primary imprint backup roller 42 **** to a continuous line location, and the pressure welding of the medium imprint belt 41 is carried out to a photo conductor 21. It is made to imprint on the medium imprint belt 41 with the primary imprint voltage to which the toner image of each color formed on a photo conductor 21 was impressed by conductive layer 41a of the medium imprint belt 41. While carrying out circulation actuation of a photo conductor 21 and the medium imprint belt 41, piling up and imprinting the toner image of each color on the medium imprint belt 41 and forming a color image By the feed section 63 of the feeding-and-discarding paper unit 6, Sheet S is picked out from a cassette 61, a detachable tray 62, or a duplication cassette (graphic display abbreviation), and it conveys to secondary imprint **** R2. And to the secondary imprint backup roller 45, the secondary imprint roller 48 is made to **** to a continuous line location, a pressure welding is carried out from the rear-face side of Sheet S, secondary imprint voltage is impressed from the secondary imprint bias generating section 129, a color image is secondarily imprinted on this sheet S, and a full color image is obtained. Moreover, in imprinting a monochrome image on Sheet S, only a black toner image is formed on a photo conductor 21, and it imprints on the medium imprint belt 41, it imprints on the sheet S conveyed to the secondary imprint field R2 like the case of a color picture, and obtains a monochrome image.

[0036] In addition, about the toner which is carrying out residual adhesion, it is removed by the peripheral face of the medium imprint belt 41 with a belt cleaner 49 after a secondary imprint. On both sides of the medium imprint belt 41, this belt cleaner 49 counters with a roller 46, is arranged, and a cleaner blade contacts to the medium imprint belt 41 to suitable timing, and it fails to scratch the toner which is carrying out residual adhesion to that peripheral face.

[0037] Moreover, while the patch sensor PS for detecting the concentration of the patch image formed in the peripheral face of the medium imprint belt 41 near the roller 43 is arranged, the reading sensor RS for a synchronization for detecting the criteria location of the medium imprint belt 41 is arranged.

[0038] It returns to drawing 1 and configuration explanation of the engine section E is continued. The sheet S by which the toner image was imprinted with the imprint unit 4 is conveyed by the fixation unit 5 arranged in the downstream of ***** secondary imprint **** R2 by the predetermined feed path (two-dot chain line) by the feed section 63 of the feeding-and-discarding paper unit 6, and is fixed to Sheet S in the toner image on the sheet S conveyed. And the sheet S concerned meets the feed path 630 further, and is conveyed by the delivery unit 64.

[0039] While this delivery unit 64 has two delivery paths 641a and 641b and one delivery path 641a is prolonged in a standard paper output tray from the fixation unit 5, delivery path 641b of another side is prolonged between the re-feeding section 66 and a multi-bottle unit in delivery path 641a and abbreviation parallel. In accordance with these delivery paths 641a and 641b, 3 sets of roller pair 642-644 are prepared, turn the sheet [finishing / fixation] S to a standard paper output tray and multi-bottle unit side, and it discharges, or in order to form an image also in the another side side side, it conveys to the re-feeding section 66 side.

[0040] the sheet S by which reversal conveyance has been carried out as mentioned above from the delivery unit 64 as this re-feeding section 66 is shown in drawing 1 — the re-feeding path 664 (two-point ****) — meeting — the gate roller pair of the feed section 63 — three which conveys to 637 and were arranged in accordance with the re-feeding path 664 — re — it consists of feed roller pair 661-663. thus, the sheet S conveyed from the delivery unit 64 — the re-feeding path 664 — meeting — a gate roller pair — by returning to 637, in the feed section 63, the non-image formation side of Sheet S turns to the medium imprint belt 41, and the secondary imprint of an image of it is attained in the field concerned.

[0041] In addition, in order to memorize the image with which the sign 113 was given through the ITA face 112 in drawing 2 from external devices, such as a host computer, it is the image memory established in the Main controller 11, and a sign 127 is RAM for memorizing temporarily the result of an operation in control data and CPU123 for controlling the engine section E etc., and a sign 128 is ROM which memorizes the operation program performed by CPU123 further.

[0042] Here, in above image formation equipment, the primary imprint bias generating section 126 which impresses primary imprint voltage to the medium imprint belt 41 in the primary imprint section R1 consists of constant voltage power supplies, and the secondary imprint bias generating section 129 which impresses secondary imprint voltage to the secondary imprint roller 48 in the secondary imprint field R2 consists of constant current power supplies.

[0043] By the way, the enlarged view of the development section 23 of drawing 1 is shown in drawing 4. However, this drawing is drawing regarded as drawing 1 from the opposite hand. In the development section 23 of the image formation equipment of drawing 1, the parallel arrangement is carried out with a position which is downward different around a photo conductor 21 from on the gravity direction in order of development counter 23K development counter 23Y for yellow, development counter 23M for Magentas, development counter 23C for

cyanogen, and for blacks. Since each development counters 23Y, 23M, 23C, and 23K consist of a basic configuration member of the same operation fundamentally, Y, M, C, and K after the numeric character which shows each part material for the time being are excluded and explained, but in order to distinguish from the member which constitutes development counters 23Y, 23M, 23C, and 23K as shown in drawing 4, Y, M, C, and K are added after a numeric character.

[0044] Each development counter consists of a processing laboratory 214, a Maine hopper 215, and a toner cartridge 220. In a processing laboratory 214 A developing roller (developer support) 25 and the feed roller 212 which supplies a developer (toner) to the developing-roller 25 front face (developer supply object), The specification-part material 213 which regulates the thickness of the toner layer currently supported by developing-roller 25 front face is arranged. It is rotating towards a graphic display. To a developing roller 25 development bias voltage from the development bias generating section 125 Supply bias voltage is impressed to the feed roller 212 from the supply bias generating section which excluded the graphic display, respectively. The toner in which frictional electrification was carried out by the revolution of a feed roller 212 is supplied to a developing roller 25 from a feed roller 212, and while the thickness of the toner layer currently supported by the front face is regulated by the specification-part material 213, the toner currently supported by developing-roller 25 front face receives the further frictional electrification.

[0045] In the Maine hopper 15, one or more agitators which stir the toner supplied through the opening of the toner from the toner cartridge 220, and are maintained at a fluid high condition are arranged (two agitators are arranged by each in the example of a graphic display.), and it conveys to a processing laboratory 214, with the fluidity of a toner maintained. Between the Maine hopper 215 and a processing laboratory 214, the party SHON wall which divides both ** to some extent from the bottom is arranged, and only the toner which overcame the top chord is conveyed from the Maine hopper 215 to a processing laboratory 214.

[0046] In addition, in the example of drawing 4, the toner cartridges 220Y, 220M, and 220C for each colors of yellow, a Magenta, and cyanogen are constituted by the same configuration, and, as for toner cartridge 220K for blacks, capacity consists of them greatly.

[0047] The location of the Maine hopper [as opposed to a processing laboratory 214 in the development counter (for example, 23K) with which each development counter is arranged at the downstream compared with the development counter (for example, 23Y) which positions differ mutually and is arranged for the upstream of a photo conductor 21] 215 is low so that clearly from drawing 4. This is not avoided with the configuration which arranges two or more development counters around the cylinder-like photo conductor 21. Therefore, the level (referred to as LY, LM, LC, and LK, respectively.) of the toner in a processing laboratory 214 is as high as the development counter arranged for the upstream if the contact location (head of the specification-part material 213) to the developing roller 25 of the specification-part material 213 is made into a criteria location, and the development counter arranged at the downstream is low. Carry out frictional electrification of the toner by the feed roller 212, and the electrification toner is conveyed with a developing roller 25. In the case of the development counter which carries out frictional electrification further while regulating the thickness of a toner layer by the specification-part material 213 The more the excessive toner does not need to accumulate on a processing laboratory 214 and the excessive toner has accumulated, the more The rate of a non-charged stagnation toner to the electrification toner which frictional electrification was carried out by the about 213 regulation member feed roller 212, and was conveyed with the developing roller 25 tends to increase, and it is not avoided that it is easy to produce the variation in the amount of electrifications of a toner.

[0048] The imprint effectiveness by which a toner image is primarily imprinted on the medium imprint belt 41 from photo conductor 21 front face in the primary imprint field RI is decided by the potential difference between a toner image and the medium imprint belt 41, since the optimum value of the potential difference changes with amounts of electrifications of a toner, its imprint remainder tends to increase and it is considered that imprint effectiveness tends to get worse in the toner image by which the variation in the amount of electrifications was developed with the large toner as mentioned above.

[0049] Moreover, although it is necessary to heighten the contact pressure force (regulation load) of the specification-part material 213 to a developing roller 25 in order to regulate a toner layer in predetermined thickness so that the level of the toner of a processing laboratory 214 is high When external additives, such as a silica, are added on the mother particle front face of a toner and the fluidity is being adjusted The rate that an external additive is embedded into a mother particle, or exfoliates from a mother particle becomes high, so that that regulation load is large, and it is easy to produce variation in the amount of electrifications of the toner with which negatives were developed after passing the head of the specification-part material 213 also from this field, and it is thought that primary imprint effectiveness tends to get worse. Moreover, since a fluidity tends to fall, such a toner is considered that primary imprint effectiveness tended to get worse also by fluid lowering.

[0050] The surface potential (entomophily surface potential) of the medium imprint belt 41 at the time of using the development section 23 of arrangement like drawing 4 for the bottom of the above guesses and the relation of primary imprint effectiveness were investigated. In this case, it is the volume resistivity of resistive layer 41b of the medium imprint belt 41 at the primary imprint voltage 250V impression time, and it is 1.5×10^{12} -ohmcm (23 degrees C, 65%RH). Impress electrification bias to the electrification roller 22 -1200V from the electrification bias generating section 121, and it is made for photo conductor 21 surface potential to be set to -670V, and was made for the potential of the photo conductor 21 exposure section to be set to -60V (bright section potential). Temperature and humidity were 15 degrees C and 35%RH.

[0051] The result is shown in drawing 5. The surface potential of the medium imprint belt 41 is displayed as "entomophily surface potential" among drawing. From the result of drawing 5, even if the surface potential (entomophily surface potential) of the medium imprint belt 41 is the same The contact location to the developing roller 25 of the specification-part material 213 is clearly made into a criteria location. The order of a development counter with the high level LY, LM, LC, and LK of the toner in a processing laboratory 214, That is, it turns out that primary imprint effectiveness is not good in order of Y toner image developed by development counter 23Y, M toner image developed by development counter 23M, C toner image developed by development counter 23C, and K toner image developed by development counter 23K. The same even if this relation puts K toner into development counter 23Y, puts in Y toner development counter 23K and it develops it, when development counters 23Y, 23M, and 23C and the toner in 23K are replaced for example, — abbreviation — In that case, the curve (curve of a black dot) of K toner of drawing 5 becomes Y toner, and the curve (white square thing curve) of Y toner only becomes K toner, and are not dependent on the color of the toner currently used after all. the level LY, LM, LC, and LK of the toner in a processing laboratory 214 — depending — primary imprint effectiveness — differing — the level of the toner in a processing laboratory 214 — it can be said that a higher development counter has worse primary imprint effectiveness.

[0052] By the way, the surface potential of the medium imprint belt 41 falls and goes as the count of a primary imprint is put on the medium imprint belt 41 like the equipment of drawing 1 in the equipment which impresses primary imprint voltage from a constant voltage power supply. Then, change of the surface potential of the medium imprint belt 41 of whenever it piles up the count of a primary imprint (count of a periphery) was investigated. This surface potential is the potential of the non-image section. Under the present circumstances, the voltage impressed to conductive layer 41a of the medium imprint belt 41 is fixed to +350V from the primary imprint bias generating section 126, and temperature and humidity are 15 degrees C and 35%RH. The result is shown in drawing 6. Among drawing, the surface potential of the medium imprint belt 41 is "entomophily surface potential", and has expressed the count of an accumulation primary imprint as "the count of an entomophily periphery."

[0053] Photo conductor surface potential is set to -670V as mentioned above by the case where drawing 6 impresses electrification bias -1200V. Although it was entomophily surface potential 350V before primary imprint bias's being 350V and performing a primary imprint, if a primary imprint is performed once, it will carry out to 297V twice, it will carry out to 270V 3 times and it will carry out to 255V 4 times, entomophily surface potential will fall to 244V, and it will go. This is to discharge and accumulate the minus electrification charge of photo conductor 21 front face in the front face of the medium imprint belt 41, and to go according to the potential difference of the surface potential of a photo conductor 21, and the surface potential of the medium imprint belt 41.

[0054] The toner image of a color which chooses a development counter as order with sufficient primary imprint effectiveness and bad order, and corresponds to them on the same conditions as drawing 5 and drawing 6 was developed on the front face of a photo conductor 21 using such equipment, and change of the imprint effectiveness of the toner image of each color when piling up in order the toner image of each color formed on the photo conductor 21, and imprinting it on the medium imprint belt 41, was investigated. The result is shown in drawing 7. The order with sufficient primary imprint effectiveness is the order of Y toner image which was shown among drawing 7 at the black rectangular head and which was developed by M toner image -> development counter 23Y developed by C toner image -> development counter 23M developed by K toner image -> development counter 23C developed by development counter 23K. The order with bad primary imprint effectiveness is the order of K toner image which was shown among drawing 7 at the white rectangular head and which was developed by C toner image -> development counter 23K developed by M toner image -> development counter 23C developed by Y toner image -> development counter 23M developed by development counter 23Y.

[0055] It turns out that the variation in primary imprint effectiveness and aggravation have little direction which develops the toner image of a color with which primary imprint effectiveness chooses a development counter as bad order, and corresponds to it on the front face of a photo conductor 21, piles up in order the toner image of each color formed on that photo conductor 21 on the medium imprint belt 41 from this result, and was imprinted. This is for compensating, when the primary imprint effectiveness of the development counter chosen [that fall whenever the surface potential of the medium imprint belt 41 of drawing 6 repeats an imprint, and carry out, and the potential difference between the toner image on a photo conductor 21 and the medium imprint belt 41 falls, and] behind becomes higher.

[0056] Although it was the example with which lowering of the potential difference between the toner image on a photo conductor 21 and the medium imprint belt 41 was compensated whenever it repeated the primary imprint using primary imprint effectiveness differing when the positions of the above development counter differ, primary imprint effectiveness changes also with the amounts of electrifications of the toner in a development counter. Drawing 8 is drawing showing the result of having investigated the amount of electrifications of a toner, and the relation of primary imprint effectiveness, and temperature and humidity are 23 degrees C and 65%RH. It turns out that primary imprint effectiveness gets worse as an optimum value exists in the amount of electrifications of a toner from a viewpoint of primary imprint effectiveness and it separates from this drawing 8. Therefore, the toner image of a color with which the primary imprint effectiveness based on the amount of electrifications of the toner of a development counter chooses a development counter as bad order, and corresponds to it is developed on the front face of a photo conductor 21. Even if it piles up in order the toner image of each color formed on the photo conductor 21 on the medium imprint belt 41 and imprints it, similarly Whenever it repeats a primary imprint, lowering of the potential difference between the toner image on a photo conductor 21 and the medium imprint belt 41 can be

compensated, and aggravation can be lessened with the variation in primary imprint effectiveness.

[0057] Moreover, primary imprint effectiveness changes also with the fluidities of the toner in a development counter. Drawing 9 is drawing showing the result of having investigated the angle of repose of a toner and the relation of primary imprint effectiveness which are one index which shows the fluidity of a toner, and temperature and humidity are 23 degrees C and 65%RH. From a viewpoint of this drawing 9 to primary imprint effectiveness, an angle of repose becomes large and it turns out that primary imprint effectiveness has the bad one where the fluidity of a toner is lower, and the one where an angle of repose is small and where the fluidity of a toner is higher has good primary imprint effectiveness. Therefore, the toner image of a color with which the primary imprint effectiveness based on the fluidity of the toner of a development counter chooses a development counter as bad order, and corresponds to it is developed on the front face of a photo conductor 21. Even if it piles up in order the toner image of each color formed on the photo conductor 21 on the medium imprint belt 41 and imprints it, similarly Whenever it repeats a primary imprint, lowering of the potential difference between the toner image on a photo conductor 21 and the medium imprint belt 41 can be compensated, and aggravation can be lessened with the variation in primary imprint effectiveness.

[0058] As mentioned above, although the image formation method of this invention has been explained based on an example, this invention is not limited to these examples, but various deformation is possible for it.

[0059]

[Effect of the Invention] Since the toner image of a color with which primary imprint effectiveness chooses a development counter as bad order, and corresponds to it from two or more development counters was developed on the front face of latent-image support according to the image formation method of this invention so that clearly from the above explanation That fall whenever the surface potential of a medium transfer medium repeats an imprint, and carry out, the potential difference between the toner image on latent-image support and a medium transfer medium falls, and primary imprint effectiveness gets worse It will be compensated when the primary imprint effectiveness of the toner image by the development counter chosen behind becomes higher. The imprint effectiveness to the medium transfer medium of a toner image being stable, and causing a poor imprint is lost, and the image formation equipment which is reliable, without also producing the cost rise of equipment can be realized.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing one operation gestalt of the image formation equipment which applies the image formation method of this invention.

[Drawing 2] It is the block diagram showing the electric configuration of the image formation equipment of drawing 1.

[Drawing 3] It is the lamination **** cross section of a medium imprint belt and a photo conductor.

[Drawing 4] It is the enlarged view of the development section of drawing 1.

[Drawing 5] It is drawing showing the result of having investigated the relation between medium imprint hair side of belt side potential and primary imprint effectiveness.

[Drawing 6] It is drawing showing the result of having investigated change of the medium imprint hair side of belt side potential of ** which piles up the count of a primary imprint.

[Drawing 7] It is drawing showing the result of having investigated change of the imprint effectiveness of the toner image of each color when piling up in order the toner image which chose and formed the development counter in order with sufficient primary imprint effectiveness, and bad order, and imprinting it on a medium imprint belt.

[Drawing 8] It is drawing showing the result of having investigated the amount of electrifications of a toner, and the relation of primary imprint effectiveness.

[Drawing 9] It is drawing showing the result of having investigated the angle of repose of a toner and the relation of primary imprint effectiveness which are one index which shows the fluidity of a toner.

[Drawing 10] It is drawing showing one example of image formation equipment equipped with the medium transfer medium.

[Drawing 11] It is the lamination **** cross section of a medium transfer medium and a photo conductor in the modification of drawing 10.

[Description of Notations]

E — Engine section

S — Sheet

L — Laser beam

R1 — Primary imprint field

R2 — Secondary imprint ****

PS — Patch sensor

RS — Reading sensor for a synchronization

LY, LM, LC, LK — Level of the toner in a processing laboratory

1 — Control unit

2 — Image support unit

3 — Exposure unit

4 — Imprint unit

5 — Fixation unit

6 — Feeding-and-discarding paper unit

11 — Main controller

12 — en zincon — truck fatty tuna

21 — Photo conductor

21a — Conductive layer

21b — Sensitization layer

22 — Electrification roller

23 — Development section

23Y — Development counter for yellow

23M — Development counter for Magentas

23C — Development counter for cyanogen

23K — Development counter for blacks

24 — Cleaning section

25, 25Y, 25C, 25M, 25K — Developing roller

41 — Medium imprint belt

41a — Conductive layer

41b — Resistive layer
41c — Insulating base
42 — Primary imprint backup roller
43 44 — Roller
45 — Secondary imprint backup roller
46 47 — Roller
48 — Secondary imprint roller
49 — Belt cleaner
50 — Electrode roller
61 — KASETSU
62 — Detachable tray
63 — Feed section
64 — Delivery unit
66 — Re-feeding section
111 — CPU
112 — Interface
113 — Image memory
121 — Electrification bias generating section
122 — Picture signal change over section
123 — CPU
124 — Patch creation module
125 — Development bias generating section
126 — Primary imprint bias generating section
127 — RAM
128 — ROM
129 — Secondary imprint bias generating section
212Y, 212M, 212C, 212K — Feed roller (developer supply object)
213Y, 213M, 213C, 213K — Specification-part material
214Y, 214M, 214C, 214K — Processing laboratory
215Y, 215M, 215C, 215K — Main hopper
220Y, 220M, 220C, 220K — Toner cartridge
630 — Feed path
637 — Gate roller pair
641a, 641b — Delivery path
642-644 — Roller pair
661-663 — Re-feeding roller pair
664 — Re-feeding path

[Translation done.]

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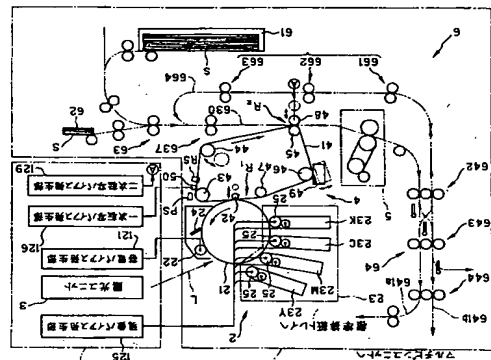
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G 03 G 15/01	113	G 03 G 15/01	113 Z 2H027	【特許請求の範囲】 【請求項1】 回転しつつ帯電手段により表面に一般に帯電され、露光手段により選択的に放電されて静電潜像が形成される潜像担持体と、この潜像担持体の表面に選択的に異なる色のカラートナーを付与して前記潜像を可視像とする複数の現像器と、順次異なる色のカラートナーにより現像されたトナー像を中間転写媒体に転写する一次転写部と、一次転写部においてバイアスを印加するための一次転写バイアス印加電極と、中間転写媒体上に重ね合わされて転写された全色カラートナー像を記録紙に転写する二次転写部とを有し、前記一次転写バイアス印加電極として定電圧電源が用いられる画像形成装置において、
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(54) 【発明の名称】 画像形成方式

(57) 【要約】
【課題】 複数の色の現像器を備え中間転写媒体にトナー像を転写する画像形成装置において、全ての色のトナー像の転写効率を安定化させる画像形成方式。
【解決手段】 潜像担持体21と、複数の現像器23 Y、M、C、Kと、順次異なる色のカラートナーにより現像されたトナー像を中間転写媒体41に転写する一次転写部R1と、一次転写部においてバイアスを印加するための一次転写バイアス印加電極126と、中間転写媒体上に重ね合わされて転写された全色カラートナー像を記録紙に転写する二次転写部R2とを有し、一次転写バイアス印加電極として定電圧電源が用いられる画像形成装置において、複数の現像器23 Y、M、C、Kから一次転写効率が悪い順に現像器を選択して対応する色のトナー像を潜像担持体21の表面に現像する。



【請求項1】 回転しつつ帯電手段により表面に一般に帯電され、露光手段により選択的に放電されて静電潜像が形成される潜像担持体と、この潜像担持体の表面に選択的に異なる色のカラートナーを付与して前記潜像を可視像とする複数の現像器と、順次異なる色のカラートナーにより現像されたトナー像を中間転写媒体に転写する一次転写部と、一次転写部においてバイアスを印加するための一次転写バイアス印加電極と、中間転写媒体上に重ね合わされて転写された全色カラートナー像を記録紙に転写する二次転写部とを有し、前記一次転写バイアス印加電極として定電圧電源が用いられる画像形成装置において、
前記複数の現像器から一次転写効率が悪い順に現像器を選択して対応する色のトナー像を前記潜像担持体の表面に現像するようにしたことを特徴とする画像形成方式。
【請求項2】 二次転写部においてバイアスを印加するための二次転写バイアス印加電極として定電圧電源が用いられることを特徴とする請求項1記載の画像形成方式。
【請求項3】 前記複数の現像器が、少なくとも現像ローラとその表面に担持されているトナー層の厚さを規制する成膜部材と配置された現像器を備え、前記規制部材の前記現像ローラに対する当接位置を基準位置として、前記現像器中におけるトナーのレベルが現像器毎に異なることを特徴とする請求項1又は2記載の画像形成方式。
【請求項4】 前記複数の現像器によるトナーの帯電量が現像器毎に異なることを特徴とする請求項1又は2記載の画像形成方式。
【請求項5】 前記複数の現像器のトナーの流動性が現像器毎に異なることを特徴とする請求項1又は2記載の画像形成方式。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】 本発明は、電子写真法を用いたプリンター、ファクシミリ、複写機等の画像形成装置の画像形成方式に関し、特に、感光体等の潜像担持体上に形成されたトナー像が一次転写され、このトナー像をさらに記録媒体に二次転写する中間転写媒体を備えた画像形成装置の画像形成方式に関するものである。
【従来の技術】 一般に、電子写真技術を用いた画像形成装置は、潜像担持体としての外周面に感光層を有する感光体と、この感光体の外周面に感光層を有する帯電手段と、この帯電手段により潜像を形成された外周面を選択的に露光して静電潜像を形成する露光手段と、この露光手段により形成された静電潜像に現像剤としてのトナーを帯電させて付与し可視像（トナー像）とする現像手段と、この現像手段により現像されたトナー像を用

紙等の記録媒体に転写させる転写装置とを有している。
【0003】そして、感光体上に現像されたトナー像を用紙等の記録媒体に転写させる転写装置としては、従来、感光体上に形成されたトナー像が転写（一次転写）され、このトナー像をさらに記録媒体に転写（二次転写）する中間転写媒体を備えたものが知られている。
【0004】図10は、このような中間転写媒体を備えた画像形成装置の1例を示す図で、(a)は概略斜視図、(b)は図(a)におけるb-b部分断面図である。
【0005】図10において、201は感光体であり、導電層201aと、この導電層201a上に形成された感光層201bとを有している。導電層201aは接地されている。
【0006】202は中間転写媒体であり、例えば体積抵抗値が $10^7 \sim 10^{14} \Omega \cdot \text{cm}$ の誘電体（中絶抗層）で構成されている。このような中間転写媒体202は、合成樹脂等と導電性カーボンを混練することによって作成することができる。
20 【0007】中間転写媒体202は、少なくとも画像形成時には感光体201と接触し、この接触部R1が一次転写部を形成する。一次転写部R1には、中間転写媒体202の内方に一次転写ローラ203が配置されており、この一次転写ローラ203の圧接によって中間転写媒体202に一次転写電圧が印加される。
【0008】また、中間転写媒体202には、二次転写電圧を印加する二次転写ローラ204が圧接され、この圧接部が二次転写部R2を形成する。二次転写部R2には、中間転写媒体202の内方からバックアップローラ205が配置されている。
30 【0009】画像形成時には、まず、感光体201および中間転写媒体202が回転駆動され、感光体201の感光層201bが帯電手段（図示せず）で一般に帯電させられた後に露光手段（図示せず）で選択的に露光されて静電潜像が形成される。次いで、静電潜像に現像手段（図示せず）で現像剤であるトナーが付与されて可視像（トナー像）となり、このトナー像が、一次転写部R1において中間転写媒体202上に転写され、その後、二次転写部R2において、この二次転写部R2に供給される用紙等の記録媒体に転写される。
40 【0010】トナー像が転写された記録媒体は、図示しない定電器を通過することによってトナー像が定着される。
【0011】上記のような均一な抵抗体で形成される中間転写媒体202を有する画像形成装置においては、一般的に転写電圧は転写部表面に当接する一次転写ローラ203により付与されるが、中間転写媒体202に込み込み等が発生したリ一次転写ローラ203に付着したトナー、部分的に電界が付与できなくなり転写部の電界が不均一となり転写された画像にむらが発生する。

【0012】そこで、中間転写媒体202として、図1に示すように、合成樹脂からなる絶縁性基板202cの上に一体的に形成された導電層202aと、その上に一体的に形成された感光体201に圧接される抵抗層202bとで構成されたものを用いるものも知られており、その場合は、その中間転写媒体202の側縁部において抵抗層202bを帯状に除去して導電層202aを帯状に露出しておき、この露出部に電極ローラが接触して一次転写電圧を印加するようにしている。このように導電層202aを有する中間転写媒体202を用いる画像形成装置においては、中間転写媒体202に至きが発生した装置におけるローラにゴミが付着した場合にも、転写り、転写部に均一な転写の電界が付与するため、転写に起因する画像むらがなくなるという長所を有する。

【0013】このような一次転写電圧が印加される導電層202aを有する中間転写媒体202を用いる画像形成装置においては、高速化のために一次転写と二次転写のタイミングを重なるようにしなければならぬため、一次転写電圧電源として定電圧電源を、二次転写電圧電源として定電流電源を用いている（特開平9-160395号）。

【0014】なお、米国特許第5,243,392号においては、体積抵抗値が略 $10^{12}\Omega\text{cm}$ 以上で、線抵抗間が0.3〜200msという高抵抗ベルトの中間転写媒体を用いて効率的に二次転写を行わせるもの提案されている。

【0015】【発明が解決しようとする課題】図10、図11のような構成において、体積抵抗率の低い中間転写媒体202を用いると、ライン間にトナーが飛び散ったり放たりする現象が顕著に発生してライン画像の劣化が顕著だったり、感光体メモリを発生させやすかったりするため、中間転写媒体202の体積抵抗率をある程度高くすることで、これらの問題は解決可能である。

【0016】しかしながら、抵抗率が高くなると、中間転写媒体に感光体からの電荷が帯電して電荷が抜け難くなり、問題が生じる。具体的には、感光体表面電位と中間転写媒体のベルト表面電位がある一定電位差以上になると放電が生じ、中間転写媒体が感光体のマイナスイオンを受け、感光体をマイナス帯電する（場合）、中間転写媒体が帯電することが起こる。感光体表面電位 V_0 は、通常、現像器の現像特性によって異なり、現像器の色あても感光体表面電位 V_0 の設定値が大きく異なる。したがって、感光体から中間転写媒体が受ける負電荷量もまらまちで、中間転写媒体表面電位が安定しないことになる。

【0017】一次転写を定電流制御することで感光体画像部に対して一定の仕事をするから、少なくとも一次転写した瞬間には中間転写媒体表面電位が安定しないこと

像器毎に異なるこの場合に適用することもできる。

【0026】本発明においては、複数の現像器から一次転写が形成される際に、複数の現像器を選択して対する色のトナー像を帯電した状態で現像器の表面に現像するようにしたもので、中間転写媒体の表面電位が帯電を繰り返す毎に低下して行って帯電したトナー像と中間転写媒体の間の電位差が低下して一次転写効率が悪化するが、後に選択された現像器によるトナー像の一次転写効率がより高くなることにより補償されることになり、トナー像の中間転写媒体への転写効率が安定して転写不良を起こすことがない。装置のコストアップも生じずに信頼性のある画像形成装置を実現することができ。

【0027】【発明の実施の形態】以下、本発明の画像形成方式を適用する電子写真法を用いた画像形成装置のプリンターの一例の全体の構成を説明する。

【0028】図1は、本発明の画像形成方式を適用する画像形成装置の1つの実施形態を示す図である。また、図2は、図1の画像形成装置の電気的構成を示すブロック図である。この画像形成装置は、イエロー（Y）、マゼンタ（M）、シアン（C）、ブラック（K）の4色のトナーを混ね合わせたフルカラー画像を形成したり、ブラック（K）のトナーのみを用いてモノクロ画像を形成する装置である。この画像形成装置では、ホストコンピュータ等から外部装置から画像信号が制御ユニット1のメインコントローラ11に与えられると、このメインコントローラ11からの指令に応じてエンジンユニット12が画像形成手段として機能するエンジンユニットEの各部を制御してシートSに画像信号に対応する画像を形成する。

【0029】このエンジンユニットEでは、像担持体ユニット2の感光体21にトナー像を形成可能となっている。すなわち、像担持体ユニット2は、図1の矢印方向に回転可能な感光体21を備えており、さらに、感光体21の周りにその回転方向に沿って、帯電手段としての帯電ローラ22、現像手段としての現像器23Y、23M、23C、23K、及び、クリーニング部24がそれぞれ配置されている。帯電ローラ22は、帯電バリエーション発生部121から高電圧が印加されており、感光体21の外周面に当接して外周面を均一に帯電させる。感光体21は、図3に示すように、導電層21aと、この導電層21a上に形成された感光層21bとを有している。

【0030】そして、この帯電ローラ22によって帯電された感光体21の外周面に向けて露光ユニット3からレーザ光1が照射される。この露光ユニット3は、図2に示すように、画像信号切換部122と電気的に接続されており、この画像信号切換部122を介して与えられる画像信号に応じてレーザ光1を感光体21上に走査露光して感光体21上に画像信号に対応する静電潜像を形成する。例えば、エンジンユニット12のCPU1

23からの指令に基づき、画像信号切換部122がパッチ作成モジュール124と連通している際には、パッチ作成モジュール124から出力されるパッチ画像信号が露光ユニット3に与えられてパッチ潜像が形成される。

一方、画像信号切換部122がメインコントローラ11のCPU11と連通している際には、ホストコンピュータ等の外部装置よりインターフェース112を介して与えられた画像信号に応じてレーザ光1を感光体21上に走査露光して感光体21上に画像信号に対応する静電潜像が形成される。

【0031】こうして形成された静電潜像は現像部23によってトナー像形成される。すなわち、この実施形態では、現像部23として、イエロー用の現像器23Y、マゼンタ用の現像器23M、シアン用の現像器23C、及び、ブラック用の現像器23Kがこの順序で感光体21に沿って配置されている。これらの現像器23Y、23M、23C、23Kは、それぞれ感光体21に対して接触自在に構成されており、エンジンユニット12からの指令に応じて、上記4つの現像器23Y、23M、23C、23Kの中の1つの現像器が選択的に感光体21に当接すると共に、現像バリエーション発生部125によって高電圧が現像部の現像ローラ25に印加されて選択された色のトナーを感光体21の表面に付与して感光体21上の静電潜像を顕在化する。

【0032】現像部23で現像されたトナー像は、ブラック用現像器23Kとクリーニング部24との間に位置する一次転写領域R1で転写ユニット4の中間転写ベルト41上に一次転写される。なお、この転写ユニット4の構造については後で詳述する。

【0033】また、一次転写領域R1から周方向（図1の矢印方向）に進んだ位置には、クリーニング部24が配置されており、一次転写後に感光体21の外周面に残留しているトナーを掻き落とす。

【0034】次に、転写ユニット4の構成について説明する。この実施形態では、転写ユニット4は、ローラ2〜47と、これら各ローラ2〜47に掛け渡された中間転写ベルト41と、この中間転写ベルト41に転写された中間トナー像をシートSに二次転写する二次転写ローラ48とを備えている。

【0035】この中間転写ベルト41は、図11で説明した従来例と同様に、図3に断面を示すように、合成樹脂からなる絶縁性基板41cの上に一体的に形成された導電層41aと、その上に一体的に形成された感光体21に圧接される抵抗層41bとで構成されたものを用いており、その中間転写ベルト41の側縁部において抵抗層41bを帯状に除去して導電層41aを帯状に露出させておき、この露出部に電極ローラ50が接触することにより、一次転写バリエーション発生部126から一次転写電圧が印加されている。そして、カラー画像をシートSに転写する場合には、一次転写バックアップローラ42と

位置へ変荷させて中間転写ペルト41を感光体21に圧接させて、感光体21上に形成される各色のトナー像を、中間転写ペルト41の導電層41aに印加された一次転写電圧によって中間転写ペルト41上に転写させ、感光体21と中間転写ペルト41を循環移動させて各色の感光体21と中間転写ペルト41上に重ね合わせで転写してトナー像を形成すると共に、結緋ユニット6の給紙部63によつてカセット61、手送りトレイ62あるいは二次転写領域R2に搬送する。そして、二次転写バックアップローラ45に対してシートSの裏面側から二次転写ローラ48を裏側位置へ変荷させて圧接し、二次転写バックアップ発生部129から二次転写電圧を印加して、このシートSにカラー二次転写を施してフルカラー画像を得る。また、モノクロ画像をシートSに転写する場合に、感光体21上にプラックトナー像のみを形成し、中間転写ペルト41上に転写し、カラー画像の場合と同様にして二次転写領域R2に搬送されてきたシートSに転写してモノクロ画像を得る。

【0036】なお、二次転写後、中間転写ベルト41の1の外周面に残留付着しているトナーについては、ベルトクリーナ49によって除去される。このベルトクリーナ49は、中間転写ベルト41を挟んでローラ46と対向し9は、中間転写帯おり、適当なタイミングでクリーナブレードが中間転写ベルト41に対して当接してその外周面に残留付着しているトナーを掻き落す。

【0037】また、ローラ43の近傍には、中間転写ホルト41の外周面に形成されるパッチ画像の濃度を検出するためのパッチセンサPSが配置されると共に、中間転写ホルト41の基準位置を検出するための同期用読取センサRSが配置されている。

【0038】図1に戻って、エンブレムEの構成説明を続ける。転写ユニット4によってトナー像が転写されたシートSは、給排紙ユニット6の給排紙5によって所定の給排紙経路(2点破線)に沿って転写ユニット5に搬送され、搬送さ下流側に配設された定着ユニット5に搬送され、搬送されてくるシートS上のトナー像をシートSに定着する。そして、当該シートSはさらに給排紙部630によって排紙部64に搬送される。

【0039】この非振紙部64は2つの非振紙部641a、641bを有しており、一方の非振紙部641aは、他方定着部5から標準非振紙トレイに延びると共に、他方の非振紙部641bは非振紙部641aと略平行に、車輪部66とマルチピンユニットとの間に延びている。これらの非振紙部641a、641bに沿って3組のローラー対642～644が設けられおり、定着済みシートSを標準非振紙トレイやマルチピンユニット側にに向けて排出したり、その他方面にも画像を形成するために再転紙部66側に搬送する。

【0040】この再給紙部66は、図1に示すように、

上記のように非鉄部6から反転搬送されてきたシートSを再給紙経路664(点線鉄)に沿って給紙部63のゲートローラ62に搬送するものであり、再給紙経路664に沿って搬送された3つの再給紙ローラ661~663で構成されている。このように、非鉄部64から搬送されてきたシートSを再給紙経路664に沿ってゲートローラ63に戻すことによって給紙部63においてシートSの表面画像形成面が中間に反転ペルト41を向いて当該面に画像形成と大反転可能となる。

【0041】なお、図 2 において、符号 113 はホスコンピュータ等の外部装置とリアルタイムコンソを介して与えられた画像を配信するためにメインコンピュータ 111 に設けられた画像メモリであり、符号 127 はエンジン部 E を制御するための制御データや CPU123 における演算結果等を一時的に記憶するための RAM であり、さらに、符号 128 である CPU123 で行う演算プログラム等を記憶する ROM である。

【0042】ここで、上記の画像形成装置においては、一次転写部R1で中間転写ベルト41に一次転写電圧を印加する一次転写バイアス発生部126は定電圧電源から構成され、二次転写部R2で二次転写ローラ48に一次転写電圧を印加する二次転写バイアス発生部129は定電流電源から構成されている。

【0043】ところで、図4に、図1の現像部23の拡大図を示す。ただし、この図は図1とは反対側から見た図である。図1の現像部23の形状は図23において、是力方向上から下にエコー用の現像器23Y、マゼンタ用の現像器23M、シアン用の現像器23C、ブラック用の現像器23Kの順に順次21の周りに異なる姿勢で並列配置されている。各現像器23Y、23M、23C、23Kは、基本的に同じ作用の基本構成部材からなるので、当面各部材を示す数字の後のY、M、C、Kを省いて説明するが、図4に示されているように、現像器23Y、23M、23C、23Kを構成する部材と区別するために数字の後にY、M、C、Kが付加される。

【0044】各現用器は、現用器214と、メインホ-
バ215と、トナーカートリッジ220とからなり、現
像室214には、現像ローラ（現像剤担持体）25と、
その現像ローラ25表面に現像剤（トナー）を供給する
供給ローラ（現像剤供給体）212と、現像ローラ25
表面に担持されているトナー層の厚さを規制する規制部
材213とが配置され、図9の方向に回転しており、現
像ローラ25には現像バリエーション発生部125から現像バ
リエーション電圧が、供給ローラ212には図示を省いた供給
バリエーション発生部から供給バリエーション電圧がそれぞれ印加さ
れており、供給ローラ212の回転により摩擦帯電され、
また、その表面に現像ローラ212から現像ローラ25へ供給
された、その表面に担持されているトナー層の厚さは規制
部材213で規制されると共に、現像ローラ25表面に

トナーはさらなる摩擦帯電を受ける。

【0045】メインホップ115内には、トナーカートリッジ220からトナー-精結晶を介して供給されたトナーを保持して流動性-精結晶状態に保つアジテータ1個以上を配置されており（図示の例では、何れも2個のアジテータが配置されている）、トナーの流動性を保つためのアジテータが配置されている。メインホップ215と現
 在現像室214へと搬送する。メインホップ215と現
 在現像室214の間には、戸蓋を下からある程度分けるパー
 ナションウエークホルバ配置され、その上辺を乗り越えたと
 ナーのみがメインホップ215から現像室214へと搬
 送される。

【0046】なお、図4の実施例において、イエロー、マゼンタ、シアンの各色用のトナーカートリッジ220 Y、220 M、220 Cは同じ形状に構成され、ブラック用のトナーカートリッジ220 Kはそれらより容積が大きい構成されている。

【0047】図4から明らかなように、各現像器は相互に姿勢が異なっており、感光体21の上流に配置されている現像器（例え23 K）に比べて下流側に配置されている現像器（例え23 K）は、現像量214に対するメインホップ215の位置が低くなっている。これは、筒筒状の感光体21の周りに複数の現像器を配置する構成では避けられないことである。そのため、現像量214とトナーのレベル（それとL.Y、L.M、L.C、L.Kとの。）は、規制部材213の現像ローラ215に対する当接位置（規制部材213の先端）を基準位置とすると、上流に配置されている現像器程高く、下流側に配置されている現像器程低くなっている。供給ローラ212でトナーを供給電流し、現像ローラ215でそのトナーを搬送し、規制部材213でトナー層の厚さを規制すると共に、規制部材213でトナー層の厚さを現像量214に余分なトナーが増えている必要はなく、その余分なトナーが増えている程、規制部材213近傍での供給ローラ212で搬送電流され現像ローラ215で搬送された帯電トナーに対する未帯電の滞留トナーの割合が高くなり、トナーの帯電量のバラツキが生じやすいことは避けられない。

【0048】一次転写領域R1で読光した2.1玻面から一
間転写ベクトル4.1上に二次転写される転写効
率を、は、は、は、の電位差の最大値によって決
まらる。その電位差の最大値は、は、は、は、の電
圧により、上記のように、転写効率が多くな
る。現像剤が十分に反応し、転写され、
りやすく、転写効率が向上しやすと考えられる。

【0049】また、現象重214のトナーのレベルが高
い程トナー層を所定の厚さに規制するために現象ローラ等
25に対する規制部材213の当接圧力（規制加重）を
高める必要があるが、トナーの母粒粒子表面にシリカ等の
外添剤を添加して流動性を調節している場合は、その規
制加重が大きい程外添剤が母粒中に埋め込まれたり母
粒の表面に付着したりする可能性がある。

粒子から剥離される割合が著くなり、この面からも、規則制御部材 2・3 の先端を過ぎた後の現象とされたトナーの帯電量にバラツキが生じやすく、一次転写効率が悪化しやすくなると考えられる。また、そのようなトナーは流動性が低下しやすいため、流動性の低下によって一次転写効率が悪化しやすいと考えられる。

【0050】以上のような推測の下に、図4のような装置の現象図23を用いた場合、中間駆写ペルト41の表面電位（中間表面電位）と一次駆写効率の関係を図6に示す。この場合、中間駆写ペルト41の抵抗値41bの体抵抗値抵抗率は、一次駆写電圧250V印加時で $1.5 \times 10^{12} \Omega \text{ cm}$ （23℃、65%RH）である。帯電バイアスを発生部121から誘電ローラ22に帯電バイアスを与え、1200V印加して感光部21表面電位が-670Vになるようにし、感光体21露光部の電位が-60V（明部）になるようにした。温度と湿度は15℃、35%RHであった。

【0051】その結果を図5に示す。図中、中間転写べ
ルト41の裏面電位は「中煤裏面電位」と表示してあ
る。図5の結果から、中間転写べルト41の裏面電位

(中核表面電位)が同じであって、明らかに、規則配材 2 1 3 の現像器 2 3 Y に対する当後位置を基準位置として、現像室 2 1 4 でのトナーのレベル L Y、L M、L C、L K が高い順の順、すなわち、現像器 2 3 Y で現像された Y トナー像、現像器 2 3 M で現像された M トナー像、現像器 2 3 C で現像された C トナー像、現像器 2 3 K で現像された K トナー像の順で反転写効率が良くないことが分かる。この関係は、現像器 2 3 Y、例 2 3 M、2 3 C、2 3 K のトナーを入れ換えた場合、例えば、現像器 2 3 Y に K トナーを入れ、現像器 2 3 K に

図 Y トナーを入れて現像しても露光同じで、その場合は、5 の K トナーの曲線（黒丸の曲線）が Y トナーになり、Y トナーの曲線（黒四角の曲線）が K トナーになるのだであり、結局、使用しているトナーの色に依存するのはなく、現像室 214 でのトナーのレベル L Y、L M、L C、L K に依存して一次転写効率が異なり、現像室 214 でのトナーのレベルが高い現像器組一次転写効率が悪いと言うことができます。

【0052】ところで、図1の装置のよつに、中間転写

置においては、一次転写回数を重ねるにつれて、中間転写ベルト411の表面電位が低下して行く。そこで、中間転写ベルト411の表面電位を重ねる毎（周回数）の中間転写ベルト411の表面電位の变化を重ねた。この表面電位は非画像部の電位である。この際、一次転写バイアス発生部126から中間転写ベルト411の導電層41aに印加する電圧は+350Vに固定しており、湿度と煙度15℃、35%RHである。その結果を図6に示す。図中、中間転写ベルト411の表面電位は「中央減周回数」で、異種一次転写回数を「中央周回数」で表示している。

【0053】図6は、帯電バイアスを-1200V印加した場合、感光体表面電位は前記のように-670Vになる。一次転写バイアスが350Vであり、一次転写を行う前は、中絶表面電位350Vであったが、一次転写を1回行うと297Vに、2回行うと270Vに、3回行うと255Vに、4回行うと244Vに中絶表面電位は低下して行く。これは、感光体21の表面電位と中間転写ベルト41の表面電位の電位差に比べて感光体21表面のマイナスイオン帯電電荷が中間転写ベルト41の表面に放電して蓄積されて行くためである。

【0054】このような装置を用いて、図6、図7と同条件で、一次転写効率が良い順と悪い順に現像器を選択して対する色のトナー像を感光体21の表面に現像し、その感光体21上に順に重ね合わせて転写したときの中間転写ベルト41上に順に重ね合わせて転写したときの各色のトナー像の転写効率の変化を調べた。その結果を図7に示す。一次転写効率が良い順は、図7中、黒四角で示した。現像器23Kで現像されたKトナー像→現像器23Cで現像されたCトナー像→現像器23Mで現像されたMトナー像→現像器23Yで現像されたYトナー像の順であり、一次転写効率が悪い順は、図7中、白四角で示した。現像器23Yで現像されたYトナー像→現像器23Mで現像されたMトナー像→現像器23Cで現像されたCトナー像→現像器23Kで現像されたKトナー像の順である。

【0055】この結果から、一次転写効率が悪い順に現像器を選択して対する色のトナー像を感光体21の表面に現像し、その感光体21上に形成される各色のトナー像を中間転写ベルト41上に順に重ね合わせて転写するようになり、一次転写効率のバラツキが少なくなる。図6の中間転写ベルト41の表面電位が転写を繰り返す毎に低下して行くことで感光体21上のトナー像と中間転写ベルト41の間の電位差が低下するのを後に選択された現像器の一次転写効率が高い高くなることによって補償することになるためである。

【0056】以上の現像器の姿勢が異なることにより一次転写効率が異なることを利用して、一次転写を繰り返す毎に感光体21上のトナー像と中間転写ベルト41の間の電位差の低下を補うようにした例であったが、一次転写効率は現像器でのトナーの帯電量によって変化する。図8は、トナーの帯電量と一次転写効率の関係を示す図である。この図8から、一次転写効率の観点からはトナーの帯電量に最適値が存在し、それから外れるに従って一次転写効率が悪化する。したがって、現像器のトナーの帯電量に基づいて一次転写効率が良い順に現像器を選択して対する色のトナー像を感光体21の表面に現像し、その感光体21上に形成される各色のトナー像を中間転写ベルト41上に順に重ね合わせる

て転写するようにしても同様に、一次転写を繰り返す毎に感光体21上のトナー像と中間転写ベルト41の間の電位差の低下を補償して一次転写効率のバラツキと悪化を少なくすることができる。

【0057】また、一次転写効率は現像器でのトナーの流動性によって変化する。図9は、トナーの流動性を示す1つの指標であるトナーの安息角と一次転写効率の関係を示す図である。この図9から、一次転写効率の観点からは安息角が大きくなりトナーの流動性が低い方が一次転写効率が悪いことが分かる。したがって、現像器のトナーの流動性に基づいて一次転写効率が良い順に現像器を選択して対する色のトナー像を感光体21の表面に現像し、その感光体21上に形成される各色のトナー像を中間転写ベルト41上に順に重ね合わせて転写するようにしても同様に、一次転写を繰り返す毎に感光体21上のトナー像と中間転写ベルト41の間の電位差の低下を補償して一次転写効率のバラツキと悪化を少なくすることができる。

【0058】以上、本発明の画像形成方式を実施例に基づいて説明してきたが、本発明はこれら実施例に限定されず種々の変形が可能である。

【0059】

【発明の効果】以上の説明から明らかなように、本発明の画像形成方式によると、複数の現像器から一次転写効率が良い順に現像器を選択して対する色のトナー像を感光体21の表面に現像するようにしたことで、中間転写ベルト41の表面電位が転写を繰り返す毎に低下して行くことで感光体21上のトナー像と中間転写ベルト41の間の電位差が低下するのを後に選択された現像器によって補償されることになり、トナー像の中間転写ベルト41上のトナー像の一次転写効率が高くなる。トナー像の中間転写ベルト41上のトナー像の一次転写効率が高くなることにより、装置のコストアップも生じずに信頼性のある画像形成装置を実現することができる。

【図面の簡単な説明】

【図1】本発明の画像形成方式を適用する画像形成装置の1つの実施形態を示す図である。

【図2】図1の画像形成装置の電気的構成を示すブロック図である。

【図3】中間転写ベルトと感光体の層構成を示す断面図である。

【図4】図1の現像部の拡大図である。

【図5】中間転写ベルトの表面電位と一次転写効率の関係を示す図である。

【図6】一次転写効率を重なる毎の中間転写ベルトの表面電位の変化を調べた結果を示す図である。

【図7】一次転写効率が良い順と悪い順に現像器を選択して形成したトナー像を中間転写ベルト上に順に重ね合わせる

わすて転写したときの各色のトナー像の転写効率の変化を調べた結果を示す図である。

【図8】トナーの帯電量と一次転写効率の関係を示す図である。

【図9】トナーの流動性を示す1つの指標であるトナーの安息角と一次転写効率の関係を示す図である。

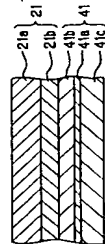
【図10】中間転写媒体を備えた画像形成装置の1例を示す図である。

【図11】図10の変形例における中間転写媒体と感光体の層構成を示す断面図である。

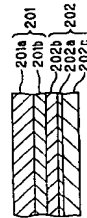
【符号の説明】

E...エンジン部
S...シート
L...レーザー光
R1...一次転写領域
R2...二次転写領域
PS...パッチセンサ
RS...同期用駆動センサ
LY、LM、LC、LK...現像室中のトナーのレベル
1...制御ユニット
2...像担持体ユニット
3...感光ユニット
4...転写ユニット
5...定着ユニット
6...給排紙ユニット
11...メインコントローラ
12...エンジンコントローラ
21...感光体
21a...導電層
21b...感光層
22...帯電ローラ
23...現像部
23Y...イエロー用現像器
23M...マゼンダ用現像器
23C...シアアン用現像器
23K...ブラック用現像器
24...クリーニング部
25、25Y、25C、25M、25K...現像ローラ
41...中間転写ベルト
41a...導電層

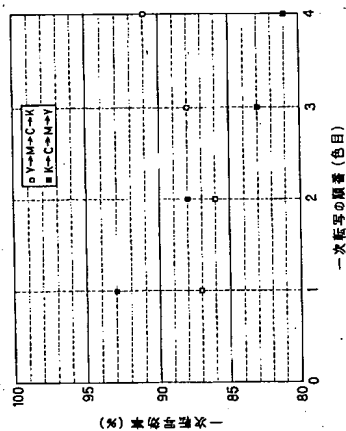
【図3】



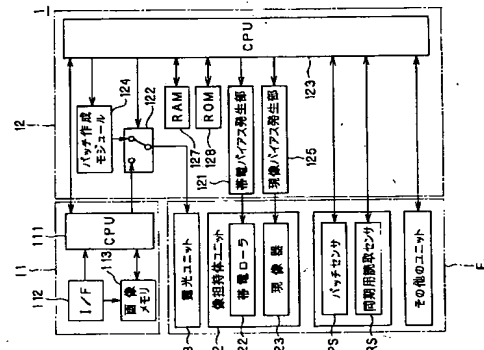
【図11】



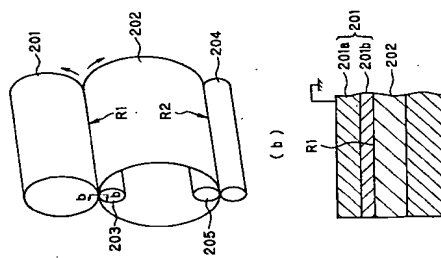
【図7】



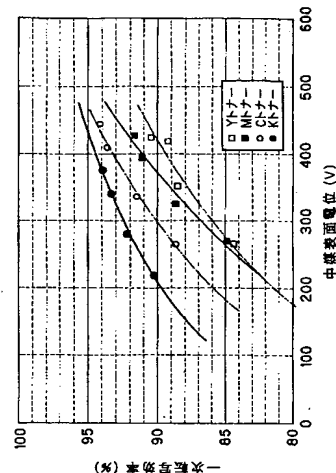
【図2】



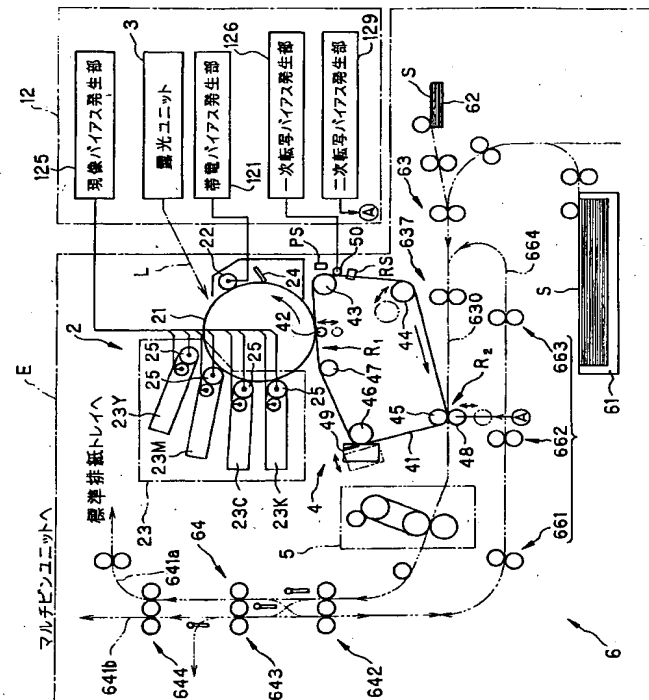
【図10】



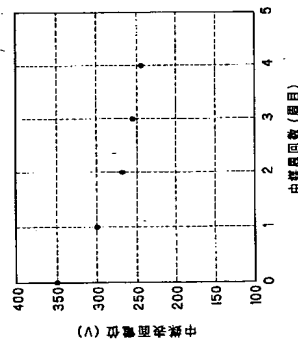
【図5】



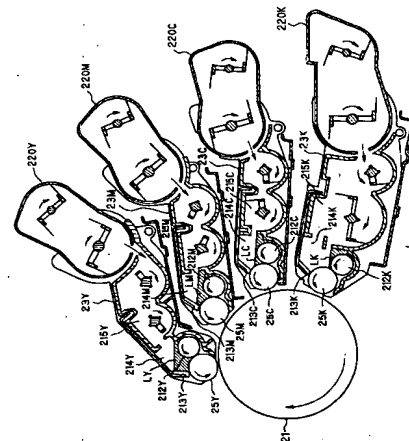
【図11】



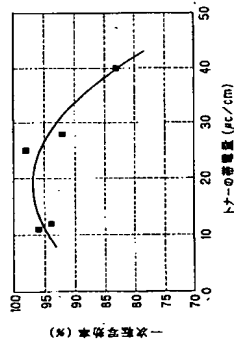
【図6】



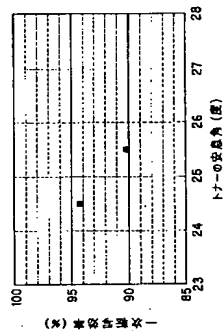
【図4】



【図8】



【図9】



フロントページの続き

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CA02 CA15
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